Naval Submarine Medical Research Laboratory

A CLINICAL TEST OF THE COMPUTER-SUPPORTED TREATMENT AND CONSULTATION FOR EMOTIONAL CRISIS PROGRAM (CATCEC)

by
Bernard L. Ryack, Ernest M. Noddin,
Douglas M. Stetson, and S. M. Luria

20031216 194

A CLINICAL TEST OF THE COMPUTER-SUPPORTED TREATMENT AND CONSULTATION FOR EMOTIONAL CRISIS PROGRAM (CATCEC)

by

Bernard L. Ryack, Ernest M. Noddin
Douglas M. Stetson, and S. M. Luria

Naval Submarine Medical Research Laboratory
Report No. 1177

Naval Medical Research and Development Command
Research Work Unit 63706N M0095.005-5010

Approved and Released by:

R. G. Walter

R. G. WALTER, CAPT, DC, USN
Commanding Officer
Naval Submarine Medical Research Laboratory

SUMMARY PAGE

THE PROBLEM

To clinically test the ability of a computer program to diagnose patients for emergency treatment of emotional crises.

THE FINDINGS

The CATCEC module accurately diagnosed 73% of the types of cases which the corpsman might encounter aboard a submarine. For these cases, the module agreed quite well with the clinician's diagnoses. This occurred even though the diagnostic criteria of the clinician differed from that used by CAT-CEC.

APPLICATION

The CATCEC module can be useful for assistance to independent duty corpsmen
attempting to manage psychological problems when consultation is not available.

ADMINISTRATIVE INFORMATION

ABSTRACT

This study investigated the ability of a computer program to diagnose patients for emergency treatment of emotional crises. Civilian and military personnel who had not been trained in clinical psychology or psychiatry interviewed 60 patients at the psychiatry department of a Naval hospital using a structured interview form. The results were entered into the Computer supported Assessment and Treatment Consultation for Emotional Crises (CATCEC) program. CATCEC and the clinicians agreed on 22 of the 30 cases (73%) for which both gave appropriate diagnosis. The remaining 30 patients seen at the clinic did not have any psychiatric problem and would not have required any psychiatric intervention at sea. They were, therefore, not appropriate for inclusion in the study.

A Clinical Test of the Computer-Supported Treatment and Consultation for Emotional Crisis Program (CATCEC)

INTRODUCTION

The Naval Submarine Medical Research Laboratory (NSMRL) has been developing a computer based system of diagnosis and treatment recommendation programs (MEDIC) to assist the independent duty hospital corpsman (IDC's) serving in operational submarines and other isolated environments. One module of this system is the psychiatric component, Computer-supported Assessment and Consultation for Emotional Crisis (CATCEC). The program was developed under contract with the Navy at the Missouri Psychiatric Institute (1). It is not intended to replace evaluation of patients in a psychiatric clinic. Instead, it is intended to be used at sea by health care providers whose psychiatric training comprises several hours of classroom instruction and a single week of observation in a mental health clinic. The program provides diagnostic and treatment advice for use when no other help is available to the isolated care provider.

The CATCEC module, described elsewhere (2), consists of a structured interview form, The Groton Interview Schedule (GIS), to be completed by the corpsman, and a computer generated diagnostic program with treatment suggestions. Information gathered from the structured interview of the patient is entered into the computer program which provides the user with a working diagnosis based on the Diagnostic and Statistical Manual of Mental Disorders, third edition (DSM-III) (3) and a suggested treatment plan. DSM-III is similar to, but not exactly the same as, DSM-III-R, the revised edition (4). Since CATCEC is a preliminary assessment tool, differences in psychiatric or psychological diagnostic terminology have little effect on its usefulness. Hedlund, Viewig and Cho (2) found that CATCEC has face validity based on evaluations of the diagnostic program, treatment guides, and glossaries by seven psychologists and psychiatrists.

The GIS was evaluated at NSMRL in 1987 to identify possible problems. Three research psychologists interviewed submarine school candidates who had been flagged as disturbed on a group screening test. The purpose of the evaluation was to identify possible problems within the GIS in future interviews. No problem areas were identified (5).

The present study is the first prospective clinical trial using patients referred to a clinic and "non-expert" interviewers. The objectives of the study were to determine if hospital corpsmen could use the program to distinguish between emotionally disturbed individuals and people with no psychiatric diagnoses. The interviewers had only one day of training in the use of the CATCEC system and had had far less training in clinical psychology than submarine hospital corpsmen receive in their curriculum. Since CATCEC can produce only about 50 diagnoses (Table

1) compared to several hundred for DSM-III-R, a second objective was to see if the DSM-III diagnosis obtained by the program would correspond to the diagnosis reached by professionals at the clinic.

METHOD

Interviewers

Eight NSMRL personnel, six military and two civilians, interviewed the patients. Five of the military interviewers were hospital corpsmen in pay grades E5 and E6. None had any training as a Psychology Technician. The sixth was a first year medical student with a B.A. in experimental psychology. One of the civilians had a B.A. in experimental psychology with a background in group testing; the other had an M.A. in experimental psychology. Only one of the interviewers had experience in clinical psychology; he interviewed 3 patients.

The eight interviewers received a three hour briefing on the use of the GIS and an hour of instruction on data entry into the CATCEC. If non-IDC interviewers with this level of computer training could diagnose disturbed individuals using the CATCEC program, then formally trained IDCs would be expected to perform even better.

Subjects

Complete diagnostic information was obtained for 60 patients, 49 men and 11 women, awaiting routine psychiatric consultation at the Psychiatry Department, Naval Hospital Portsmouth, Virginia, who volunteered to participate in this study. All were active duty military personnel, E1 to E7 (mean = 3.4). Their ages ranged from 18 to 40 (mean = 24.9). Of the 60 subjects, 27 were attached to ships, and 33 were assigned to staffs or other shore duty. Twenty-three patients were self-referred to the psychiatry department, and the rest were referred from a variety

Table 1. Diagnoses which can be reached by CATCEC.

Functional Disorders
  Thought Disorders
    Schizophrenic Disorders
    Paranoid Disorders
    Brief Reactive Psychosis

  Affective Disorders
    Depressive Episode
    Manic Episode

  Anxiety Disorders
    Manifest Anxiety
    Phobias
    Panic
    Obsessive-Compulsive
    Post-Traumatic Stress

Personality Disorders
  Antisocial Personality Disorder
  Paranoid Personality Disorder
  Passive Agressive Personality Disorder
  Borderline Personality Disorder
  Histrionic Personality Disorder
  Narcissistic Personality Disordeer
  Dependent Personality Disorder
  Schizoid Personality Disorder
  Compulsive Personality Disorder

Organic Disorders *
  Delirium
  Dementia
  Amnesia
  Alcohol/Drug Problems

of sources, usually a ship's corpsman or doctor. None of the patients was a psychiatric emergency.

Procedure

Patients were first interviewed using the GIS. The interviews lasted about one-half hour. Data from the GIS were entered into the CATCEC program, and a diagnosis was obtained. No information from the GIS or the CATCEC programs was provided to the clinicians until after the subject's evaluation was complete. Thus, neither interviewer had knowledge of the other's diagnoses until after both had been made independently. The patients received no results from the GIS interview.

Criteria: The clinician's diagnoses were taken to be correct. Table 1 shows that the CATCEC diagnoses fall into these categories: (1) Functional Disorders, broken down into Thought Disorders, Affective Disorders, Anxiety Disorders; (2) Personality Disorders; and (3) Organic Disorders (only a few of the approximately 50 organic disorders are listed). The CATCEC diagnosis and the clinician's diagnosis were considered to be in agreement if both diagnoses were in the same category. For example, a post-traumatic stress disorder and manifest anxiety were considered in agreement. A dysthymic disorder and depressive episode were a match. If the clinician concluded that a problem had been resolved and CATCEC did not produce a diagnosis for the patient, this was considered agreement, since the patient was not displaying symptoms at the time of the interview. The clinician's diagnoses were based on DSM-III-R, while CATCEC made diagnoses based on DSM-III. Both DSM-III-R and CATCEC allow multiple diagnoses. If the CATCEC diagnosis matched at least one of the clinician's diagnoses, this was also considered agreement. An example would be a

Table 2. Diagnoses assigned by the Naval Hospital Clinic for which no comparable CATCEC diagnoses is available

n	Clinic Diagnosis		CATCEC Diagnosis
9	Occupational Problem	6	Anxiety
		1	Depression
		2	No Diagnosis
4	Life Circumstance Problem	4	Anxiety
3	Marital Problem/Discord	3	Anxiety
4	Psychological Factors Affecting Physical Condition	3	Anxiety
		1	No Diagnosis
3	Adjustment Disorder	3	Anxiety
2	Adult Antisocial Behavior	2	Anxiety
2	Sleepwalking/Somnambulism	2	No Diagnosis
1	Gender Identity Disorder	1	Anxiety
1	Other Interpersonal Problem	1	Anxiety
1	Developmental Disorder	1	No Diagnosis

CATCEC diagnosis of a depressive episode compared to the clinician's diagnoses of marital problem and major depression.

RESULTS

The cases were classified as follows: those for which CATCEC and the clinician agreed on the diagnosis; those for which CATCEC and the clinician disagreed; and those cases for which CATCEC, with its limited set of diagnoses, had no diagnosis comparable to that made by the clinicians.

Of the 60 patients for whom there was complete data, 30 could not be given the same diagnosis by CATCEC and the clinician, because CATCEC does not include these diagnoses. Table 2 lists the clinician's diagnoses for which there are no CATCEC equivalent. They include, for example, occupational and marital problems, sleepwalking, and gender identity. These cases were dropped. Table 2 also lists the CATCEC diagnoses for these patients.

It is interesting to compare the clinician's and CATCEC diagnoses. Four of the 30 cases cannot be considered to be relevant psychiatric diagnoses: the two sleepwalking cases, the gender identity problem, and the developmental disorder. If we eliminate these from consideration, then we see that the computer produced a diagnosis of "anxiety" for 22 of the remaining 26 cases, one diagnosis of "depression," and

Table 3. Diagnoses agreed on by CATCEC and the clinic.

CATCEC	Clinic
Atypical drug reaction	Alcohol dependent
Depressive episode	Major depression
Manifest anxiety	Post-trauma stress disorder
Other intox. reaction to alcohol	Alcohol abuse
Depressive episode	Depression
Intox. reaction to inhalants	Alcohol & multi-drug abuse
Manifest anxiety	Dream anxiety disorder
Depressive episode	Major depression
Manifest anxiety phobia	Simple phobia
Depressive episode	Depressive disorder
Alcohol/drug use	Alcohol dependent
Manifest anxiety	Post-trauma stress disorder
Manifest anxiety	General anxiety disorder
Depressive episode	Dysthymic disorder
Alcohol/drug use	Alcohol dependence
No diagnosis	Adjustment disorder resolved
No diagnosis	No diagnosis
No diagnosis	No diagnosis
No diagnosis	No diagnosis
No diagnosis	No diagnosis
No diagnosis	No diagnosis
No diagnosis	No diagnosis

4

Table 4. Diagnostic disagreements between CATCEC and the clinic.	
CATCEC	**Clinic**
Manifest anxiety	No diagnosis
Depressive episode	Personality disorder
Manifest anxiety	No diagnosis
Manifest anxiety	Cyclothymic disorder
Manifest anxiety	Personality disorder
Manifest anxiety	Personality disorder
No diagnosis	Alcohol/drug abuse & personality
No diagnosis	Panic disorder/simple phobia disorder

"no diagnosis" for the other 3 cases. The diagnoses of "anxiety" and "depression" seem quite reasonable in view of the referral reason.

This left 30 cases for evaluation. Of these, CATCEC and the clinician agreed on the diagnosis of 16 cases (53%) and further agreed that 6 cases (20%) did not fall into any formal diagnostic category. Neither CATCEC nor the clinicians made a diagnosis of those 6 cases. Table 3 lists the diagnoses by both CATCEC and the clinicians which were judged to be in agreement.

There was disagreement on 8 cases (27%). Table 4 lists the two sets of diagnoses. CATCEC produced two diagnoses when the clinicians gave no diagnosis; conversely, the clinicians gave two diagnoses when CATCEC did not, and there was outright disagreement on the other four cases.

Since no valid comparison could be made between the CATCEC diagnoses and the clinicians diagnoses in 30 of the 60 cases, another type of analysis was carried out. The CATCEC diagnoses were compared to the patient's stated reason for consultation. We reasoned that if the CATCEC diagnosis was directly related to the reason for referral, this could be construed as providing support for the validity of the CATCEC diagnosis. For example, if the CATCEC diagnosis was "manifest anxiety" and the reason for referral was stress, tension, or anxiety, this was taken to be agreement. If the patient was referred because of trouble sleeping or for sexual problems, and the CATCEC diagnosis was anxiety, it seemed reasonable to consider this agreement. In one case, the referral reason was migraine headaches and the CATCEC diagnosis was "organic reaction associated with physical illness," this was considered agreement. There were 12 cases of relatively clear agreement between the referral reason and the CATCEC diagnosis and eight cases of possible agreement. In five cases, the reasons for referral were not clear enough to form a conclusion -- for example, "wants discharge from the Navy," or "unspecified problems," or "conflict with Leading Petty Officer." In the remaining cases, CATCEC gave no diagnosis for patients whose reasons for referral were sleepwalking, excessive sweating, and slow learner. Table 5 gives the details.

Table 5. 30 cases - No valid comparison.		
Referral Reason	CATCEC Diagnosis	Conclusion
1. Stress	Physical injury & illness; drug use/anxiety	Agree
2. Stress	Depression	Possible
3. Stress	Anxiety	Agree
4. Stress/anxiety	Anxiety/phobia	Agree
5. Stress/depression	Anxiety	Agree
6. Stress/depression	Anxiety	Agree
7. Stress	Anxiety	Agree
8. Stress	Anxiety	Agree
9. Stress related bowel problems	Physical injury & illness/Anxiety	Agree
10. Tension	Anxiety	Agree
11. Undefined emotional outburst	Physical injury/illness; alcohol abuse; anxiety	Possible
12. Emotionally upset	Anxiety	Not enough info to evaluate
13. Confusion/depression acting out	Anxiety	Possible
14. Talk of suicide	Anxiety/panic disorder	Possible
15. Problem with anger	Anxiety	Not enough info to evaluate
16. Migraine headaches	Organic reaction associated with physical illness; anxiety/ obsessive compulsive	Agree
17. Excessive sweating	No diagnosis	
18. Sleepwalking	No diagnosis	
19. Sleepwalking	No diagnosis	
20. Trouble sleeping	Anxiety	Agree
21. Family problems	Multiple drugs; anxiety	Possible
22. Marriage problem	Anxiety	Possible
23. Fight with spouse	Anxiety	Not enough info to evaluate
24. Sex problem	Anxiety	Possible
25. Conflict w/L.P.O.	Anxiety	No
26. Trouble concentrating	Anxiety; obsessive/compulsive	Agree
27. Slow learner	No diagnosis	
28. Wants discharge from Navy	No diagnosis	Not enough info to evaluate
29. Alcohol abuse follow-up	No diagnosis	Possible, since this is just a follow-up

In summary, in 20 of the 30 cases, the CATCEC diagnosis seemed to show plausible agreement with the reason for referral. There did not seem to be any case of clear disagreement. Table 2 shows that for the 26 patients for whom there was some psychological diagnosis, CATCEC's diagnosis was "anxiety" in every case but one. In no case would this be considered a gross error. Thus, CATCEC arrived at a reasonable diagnosis in 48 of 56 cases (85%).

DISCUSSION

We have first investigated whether or not CATCEC can correctly diagnose those patients who fall within its diagnostic range. Of 30 such patients, 22 (73%) were correctly diagnosed -- that is, the CATCEC diagnosis agreed with the clinician's diagnosis. CATCEC agreed well with the clinician's diagnoses in the areas of anxiety, depression, and "no diagnosis." It also worked well in the area of substance abuse.

CATCEC did not work as well in the areas of personality disorders. For CATCEC to reach such a diagnosis, it must have confirming evidence from the patient's workmates. CATCEC asks the question as to whether or not certain symptoms have been confirmed by workmates. If the hospital corpsman does not enter a positive answer into the program, CATCEC will not produce such a diagnosis. The reason behind it is that a patient may complain during a psychiatric interview that he is depressed or has thoughts of suicide simply because he wants to get off the ship. The interviewer must determine that the patient has said such things before to his workmates. In several cases, CATCEC did not make a correct diagnosis because the interviewer could not confirm the symptoms.

An essential difference between the CATCEC approach and the typical psychiatric approach to making a psychiatric diagnosis is that CATCEC is "symptom driven" and DSM-III-R is "reason driven." That is, CATCEC is not aimed so much at strictly identifying illnesses as it is at evaluating the severity of an illness, whatever it is. It was designed to guide the corpsman in treating his patient. Since CATCEC is designed for unsupervised use by health care providers at sea, it is important to determine what would have been the result of CATCEC's incorrect diagnoses. The first question that arises concerning these patients is, were these patients who were incorrectly diagnosed by CATCEC dangerous to the submarine or to themselves? Of the 8 disagreements, in two cases the clinicians gave no diagnosis, indicating that no treatment was necessary. Of the remaining 6 cases, the clinicians diagnosed four personality disorders, one cyclothymic disorders, and one simple phobia. None of these patients would have been threatening to the operation of submarines. The patient with the cyclothymic disorder could be considered dangerous. Although this case was misdiagnosed by CATCEC, it, nevertheless, did provide a warning of potential "danger to others." So, even in this case, CATCEC would have identified the most significant threat presented by the case.

The second question is, would the CATCEC diagnosis have resulted in inappropriate treatment? CATCEC had 5 diagnoses of anxiety, 1 diagnosis of depression, and made no diagnosis in two cases. The recommended treatments for these diagnoses would not have resulted in any treatment that would have endangered the patient. The submarine, however, might have lost the services of these patients, because tranquilizers might have been prescribed.

7

Among the subject population there were no life-threatening organic conditions or serious thought disorders which at sea would have mandated a medical evacuation. Thus CATCEC never had to identify a patient who was seriously ill. But for those patients in the study group, CATCEC performed well within its capabilities.

Among the subject population, there were no life-threatening organic conditions or serious thought disorders which at sea would have mandated a medical evacuation. Thus, CATCEC never had to identify a patient who was seriously ill. Indeed, it was largely for this reason that half the subject population had to be dropped from the study: they were not, in fact, suffering from any specific psychological disorder. At sea, the corpsman would most probably not have thought it necessary to turn to CATCEC. For those patients who had some psychological disorder according to the clinicians, CATCEC performed well as an information resource for corpsmen.

Future research should test CATCEC as it was designed to be used, by IDCs either in submarines or aboard surface ships. Moreover, the performance of IDCs should be compared to CATCEC to determine the extent to which CATCEC improves IDC performance.

REFERENCES

1. Levin, J. S., Hedlund, J. L., and Viewig, B. Computer-supported assessment and consultation for emotional crises in a submarine environment. IEEE 1983 Proceedings of the Seventh Annual Symposium on Computer Applications in Health Care, pp. 940-943.

2. Hedlund, J., Viewig, B. W., and Won Cho, D. Computer consultation for emotional crises: An expert system for "non experts." Computers in Human Behavior, 3, 109-127, 1987.

3. DSM-III: A Diagnostic and Statistical Manual of Mental Disorders (Third Edition). R. L. Spitzer, A. E. Skodol, M. Gibbon, and J. B. W. Williams. Washington, DC: American Psychiatric Institute Press, Inc., 1981.

4. DSM-III-R: A Diagnostic and Statistical Manual of Mental Disorders (Revised Edition). R. L. Spitzer, M. Gibbon, A. E. Skodol, J. B. W. Williams, and M. B. First. Washington, DC: American Psychiatric Institute Press, Inc., 1989.

5. Unpublished NSMRL study.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF THE REPORT Approved for public release; distribution unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	

4. PERFORMING ORGANIZATION REPORT NUMBER(S) NSMRL Report # 1177	5. MONITORING ORGANIZATION REPORT NUMBER(S) NA

6a. NAME OF PERFORMING ORGANIZATION Naval Submarine Medical Research Laboratory	6b. OFFICE SYMBOL (If Applicable)	7a. NAME OF MONITORING ORGANIZATION Naval Medical Research and Development Command

6c. ADDRESS (City, State, Zip Code) Naval Submarine Base New London Groton, CT 06349-5900	7b. ADDRESS (City, State, Zip Code) National Naval Medical Center, Bldg 1, Tower 12, Bethesda, MD 20889-5044

8a. NAME OF FUNDING/SPONSORING ORGANIZATION Same as 7a	8b. OFFICE SYMBOL (If Applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

| 8c. ADDRESS (City, State, Zip Code) Same as 7b | 10. SOURCE OF FUNDING NUMBERS |

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.
62233N	MM33C30	002	5004

11. TITLE (Include Security Classification)
(U) A clinical test of the computer-supported treatment and consultation for emotional crisis program (CATCEC)

12. PERSONAL AUTHOR(S)
Bernard L. Ryack, Ernest M. Noddin, Douglas M. Stetson, and S. L. Luria

13a. TYPE OF REPORT Interim	13b. TIME COVERED FROM ____ TO ____	14. DATE OF REPORT (Year, Month, Day) 1992 February 6	15. PAGE COUNT 8

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	clinical psychology; submarine personnel; submarine hospital corpsmen; artificial intelligence; psychiatric diagnosis

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This study investigated the ability of a computer program to diagnose patients for emergency treatment of emotional crises. Civilian and military personnel who had not been trained in clinical psychology or psychiatry interviewed 60 patients at the psychiatry department of a Naval hospital using a structured interview form. The results were entered into the Computer-supported Assessment and Treatment Consultation for Emotional Crisis (CATCEC) program. CATCEC and the clinicians agreed on 22 of the 30 cases (73%) for which both gave appropriate diagnosis. The remaining 30 patients seen at the clinic did not have any psychiatric problem and would not have required any psychiatric intervention at sea. They were, therefore, not appropriate for inclusion in the study.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT [X] UNCLASSIFIED/UNLIMITED [ ] SAME AS REPORT [ ] DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL Susan D. Monty, Publications Office	22b. TELEPHONE (Include Area Code) (203) 449-3967	22c. OFFICE SYMBOL

DD Form 1473, JUN 86 Previous editions are obsolete. SECURITY CLASSIFICATION OF THIS PAGE

S/N 0102-LF-014-6603